Claims

1. A process for purifying an acetonitrile feedstock comprising acetonitrile, 16 % up to 90 % by weight of water, low boiling impurities having a boiling temperature lower than the acetonitrile/water azeotrope boiling point, and high boiling impurities having a boiling temperature higher than the acetonitrile boiling point, the process comprising in sequence the steps of:
   A) introducing the feedstock into a distillation column and, by performing a distillation, separating the acetonitrile/water azeotrope and the low boiling impurities from the high boiling impurities, the acetonitrile/water azeotrope and the low boiling impurities being drawn as a vapor from the top of said distillation column, the high boiling impurities being produced as the distillation column bottoms;
   B) feeding the acetonitrile/water azeotrope and the low boiling impurities to a pervaporation unit capable of separating the water from the acetonitrile, the majority of water being collected as permeate from the pervaporation unit, and the acetonitrile, low boiling impurities and remaining water being collected as retentate;
   C) introducing the retentate of the pervaporation unit into a distillation column and, by performing another distillation, withdrawing the remaining acetonitrile/water azeotrope and the low boiling impurities as a vapor, wherein the acetonitrile is recovered from the distillation column bottoms.
2. A process for purifying an acetonitrile feedstock comprising acetonitrile, 16 % up to 90 % by weight of water, low boiling impurities having a boiling temperature lower than the acetonitrile/water azeotrope boiling point, and high boiling impurities having a boiling temperature higher than the acetonitrile boiling point, the process comprising in sequence the steps of:
   A') introducing the feedstock into a distillation column and, by performing a distillation, separating the acetonitrile/water azeotrope and the low boiling impurities from the high boiling impurities, the high boiling impurities being produced as the distillation column bottoms, a majority of the low boiling impurities being drawn as a vapor from the top of said distillation column, and the acetonitrile/water azeotrope and a remaining part of the low boiling impurities being drawn as a side draw of that distillation column;

B') feeding the acetonitrile/water azeotrope and the low boiling impurities to a pervaporation unit capable of separating the water from the acetonitrile, the majority of water being collected as permeate from the pervaporation unit, and the acetonitrile, low boiling impurities and remaining water being collected as retentate;

C') introducing the retentate of the pervaporation unit into a distillation column and, by performing another distillation, withdrawing the acetonitrile/water azeotrope and the low boiling impurities as a vapor, wherein the acetonitrile is recovered from the distillation column bottoms.

3. A process according to claim 2 wherein the acetonitrile/water azeotrope leaving the column, in which the distillation of step C' is performed, is recycled to the acetonitrile feedstock and introduced into the distillation column, in which the distillation of step A' is performed.

4. A process according to any of claims 1 to 3, wherein the distillation of step A or A' is performed in a first distillation column and the distillation of step C or C' is performed in a separate second distillation column.

5. A process according to any of claims 1 to 4 wherein the step, in which the acetonitrile/water azeotrope and the low boiling impurities leaving the column after the distillation of step A or A' are fed to a pervaporation unit, is performed by first condensing the acetonitrile/water azeotrope and the low boiling impurities and then sending the condensate to the pervaporation unit.

6. A process according to any of claims 1 to 4 wherein the step, in which the acetonitrile/water azeotrope and the low boiling impurities leaving the column after the distillation of step A or A' are fed to a pervaporation unit, is performed by sending the acetonitrile/water azeotrope and the low boiling impurities as vapours under pressure over the pervaporation unit.

7. A process according to any of claims 1 to 6 wherein the permeate of the pervaporation is recycled to the acetonitrile feedstock and introduced into the distillation column in which the distillation of step A or A' takes place.

8. A process for purifying an acetonitrile feedstock comprising acetonitrile, 16 % up to 90 % by weight of water, low boiling impurities having a boiling temperature lower than the acetonitrile/water azeotrope boiling point, and high boiling impurities having a boiling temperature higher than the acetonitrile boiling point, the process comprising in sequence the steps of:

A") introducing the feedstock into a distillation column and, by performing a distillation at below atmospheric pressure, separating the acetonitrile/water azeotrope and the low boiling impurities from the high boiling impurities, the high boiling impurities being produced as distillation column bottoms, the total or majority of low boiling impurities being drawn as vapor via the top of the distillation column and the acetonitrile/water azeotrope and potentially remaining low boiling impurities being drawn as a side draw of that distillation column;

C") introducing the acetonitrile/water azeotrope side draw into a distillation column and, by performing another distillation, at atmospheric pressure, enriching the acetonitrile/water azeotrope with water and withdrawing it as a vapor, wherein the acetonitrile is recovered from the distillation column bottoms.

9. A process according to claim 8, wherein the distillation of step A" is performed in a first distillation column and the distillation of step C" is performed in a separate second distillation column.

10. A process according to claim 8 or 9 wherein the pressure during the distillation of step A" is between 150 and 400 mbar, and more preferably between 200 and 220 mbar and the azeotrope leaving the column after the distillation of step A" as a side draw has a water content between 7.0 % by weight and 13 % by weight, and more preferably between 8.5 and 9.5 % by weight.

11. A process according to any of claims 8 to 10 wherein the acetonitrile/water azeotrope leaving the column, in which the distillation of step C" is performed, is recycled to the acetonitrile feedstock and introduced into the distillation column, in which the distillation of step A" is performed.

12. A process according to any of the preceding claims, wherein the water content in the feedstock is at least 50 % by weight.

13. A process according to any of the preceding claims, wherein the pH of the feedstock, before being introduced into the distillation column to perform the distillation of step A, A' or A" is adapted with an acid or base.

14. A process according to any of the preceding claims, wherein the distillation column bottoms produced after the distillation of step C, C' or C", containing the acetonitrile, are distilled once more in a distillation column, the pure acetonitrile being drawn as vapor from the distillation column and the evaporation residue being produced as column bottoms after this additional distillation.

15. A process according to any of the preceding claims, wherein the acetonitrile being produced as the column bottoms after the distillation of step C, C' or C" or the pure acetonitrile being drawn as vapor and condensed after the additional distillation, are sent over a bed of activated carbon.